

ANALYSIS of VISITORS' PERCEPTION ON CIRCULATION COMFORT AND ACCESSIBILITY AT MASJID RAYA BAITURRAHMAN BANDA ACEH

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Abstract: Studies on spatial comfort and circulation effectiveness in mosque complexes, particularly those integrating universal design principles and national accessibility standards, remain limited in Indonesia. This study aims to assess visitors' perceptions of spatial comfort and circulation effectiveness in the Baiturrahman Grand Mosque, Banda Aceh, in relation to Permen PUPR No.14/Prt/M/2017. A qualitative descriptive approach was applied, combining field observations, semi-structured interviews with 40 visitors, and spatial layout analysis. Findings reveal that 74% of visitors considered the overall circulation effective, while 26% perceived it as less comfortable or uncomfortable. Key shortcomings include narrow ramps in less strategic locations, escalators that are frequently non-operational, long walking distances to the women's ablution area, the absence of guiding blocks for visually impaired users, and slippery marble floors during rain. Practical recommendations include widening and relocating ramps, ensuring escalator functionality, installing guiding blocks, applying anti-slip coatings, reducing travel distances for vulnerable groups, and improving signage with larger fonts, higher contrast, and the addition of the Acehnese language. These findings offer empirically grounded recommendations to enhance inclusivity and accessibility in large-scale religious complexes, serving as a reference for architects, facility managers, and policymakers.

Keywords: visitors' perceptions; circulation comfort; inclusive architecture

Abstrak: Kajian mengenai kenyamanan spasial dan efektivitas sirkulasi pada kompleks masjid, khususnya yang mengintegrasikan prinsip desain universal dan standar aksesibilitas nasional, masih terbatas di Indonesia. Penelitian ini bertujuan untuk menilai persepsi pengunjung terhadap kenyamanan spasial dan efektivitas sirkulasi di Masjid Raya Baiturrahman, Banda Aceh, dalam kaitannya dengan Permen PUPR No.14/Prt/M/2017. Pendekatan deskriptif kualitatif digunakan dengan mengombinasikan observasi lapangan, wawancara semi-terstruktur terhadap 40 pengunjung, dan analisis tata ruang masjid. Hasil penelitian menunjukkan bahwa 74% pengunjung menganggap sirkulasi secara keseluruhan efektif, sementara 26% menilai kurang nyaman atau tidak nyaman. Kekurangan utama meliputi ramp yang sempit dan berada di lokasi kurang strategis, eskalator yang sering tidak berfungsi, jarak berjalan yang jauh menuju area wudu perempuan, tidak tersedianya guiding block bagi pengguna tunanetra, serta lantai marmer yang licin saat hujan. Rekomendasi praktis mencakup pelebaran dan relokasi ramp, memastikan eskalator berfungsi, pemasangan

guiding block, penerapan lapisan anti-selip, pengurangan jarak tempuh bagi kelompok rentan, serta peningkatan kualitas papan petunjuk dengan huruf lebih besar, kontras lebih tinggi, dan penambahan bahasa Aceh. Hasil penelitian ini menyajikan rekomendasi yang dirumuskan berdasarkan bukti empiris untuk meningkatkan inklusivitas dan aksesibilitas kompleks ibadah berskala besar, serta dapat menjadi acuan bagi arsitek, pengelola fasilitas, dan pembuat kebijakan.

Kata kunci: persepsi pengunjung; kenyamanan sirkulasi; arsitektur inklusif

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Introduction

Mosques are not only places of worship but also serve as important centers for education, social interaction, and cultural activities within Muslim communities (Imanuddin et al., 2022). To support these various roles, spatial and circulation design must accommodate the diverse needs of visitors, including the elderly, women, children, and persons with disabilities (Marua et al., 2020), in line with the principle of form follows function (Louis Sullivan in Primayanti, 2020).

The Universal Design Theory (Story, 1998) emphasizes equitable use, perceptible information, and low physical effort to create inclusive spaces accessible to all users. In Indonesia, these ideals are reinforced by Permen PUPR No.14/Prt/M/2017 (Permen PUPR No.14, 2017), which mandates public buildings, including mosques, to provide accessible infrastructure such as ramps, handrails, guiding blocks, and clear signage. Similar principles have been emphasized globally in the context of inclusive architecture and religious facilities (Rahim et al., 2014; Alzamil & Alqandi, 2021; Tri Putri et al., 2022).

Previous studies have reported recurring barriers to mosque accessibility, such as inadequate circulation flow, limited tactile guidance for visually impaired users, and poor maintenance of accessibility features (Sarsak, 2021). Comfort and accessibility are also influenced by spatial dimensions, clarity of orientation, materials, lighting, and the overall circulation flow (Budaiwi, 2011; Indriana, 2019; Mahfudhah & Taher, 2022; Fatimah & Aji, 2022; Reni et al., 2023). Effective circulation design should connect key mosque facilities—including parking areas, ablution spaces, prayer halls, and plazas—while ensuring safety, maintaining culturally appropriate gender separation, and supporting universal accessibility (Ching in Lajjah & Paryoko, 2023; Safriana, 2017; Aliya & Yuli, 2021). The effectiveness of spatial planning and circulation can be assessed by how easily and safely visitors can reach their destinations (Budo et al., 2020; Najwa et al., 2022).

Although mosque accessibility has been widely studied, few works integrate user perceptions with assessments of universal design compliance,

especially in large-scale religious landmarks in Indonesia. This study fills that gap by integrating user perceptions and regulatory compliance assessments of universal design, focusing on Masjid Raya Baiturrahman in Banda Aceh, an iconic mosque accommodating over 23,000 congregants after revitalization (Abubakar, 2017). The findings are expected to guide design improvements that harmonize aesthetic value, cultural meaning, and inclusivity in line with universal design principles and national regulations.

Method

This study employed a qualitative descriptive approach, conducted at Masjid Raya Baiturrahman in Banda Aceh. The research location is illustrated in Figure 1. Data were collected through field surveys and semi-structured interviews to explore visitors' perceptions of circulation comfort and spatial layout in depth. The aspects assessed include comfort from physical factors, clarity of orientation, and environmental factors (Table 1).

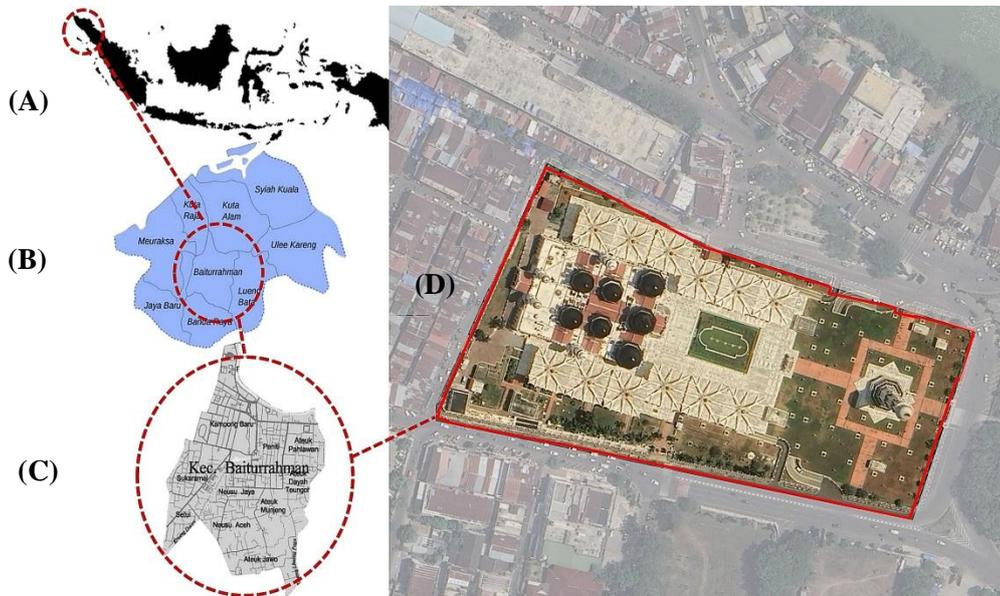


Figure 1. Research location map showing (A) Indonesia (illustrative coordinates: 0.7893° S, 113.9213° E), (B) Aceh Province (illustrative coordinates: 4.6951° N, 96.7494° E), (C) Banda Aceh City (illustrative coordinates: 5.5483° N, 95.3238° E), and (D) Masjid Raya Baiturrahman as the research site (precise coordinates: 5°33'12.9" N, 95°19'02.2" E).

Source: Processed from google, 2024

Table 1. Aspects for assessing visitor comfort and circulation effectiveness

Aspect	Indicator	Description
Comfort	Physical factors	Availability of sufficient and adequate circulation path space
	Orientation clarity	Clarity of orientation for visitor circulation

Aspect	Indicator	Description
	Environmental factors	The existence of facilities that can provide comfort with climate conditions

The study involved 40 respondents from various districts and cities within Aceh province as well as from outside the province, such as North Sumatra. They came from Banda Aceh, West Aceh, Aceh Besar, and other areas. The distribution of origin and visit intensity is shown in Figure 2. Respondents consisted of 12 males and 28 females, aged between 16 and 62 years, representing diverse groups such as students, employees, housewives, elderly visitors, and tourists from outside the city. A more detailed demographic profile is presented in Table 2.

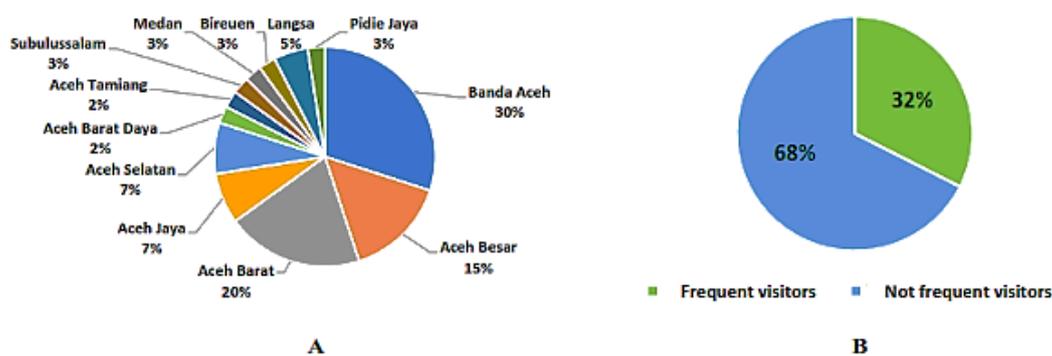


Figure 2. (A) Origin of visitor arrivals; and (B) Intensity of visitor arrivals

Table 2. Respondent characteristics

Characteristics	Categories	Number of people	Percentage (%)
Gender	Male	22	55
	Female	18	45
Age	< 25 years	12	30
	25-40 years	20	50
	>40 years	8	20
Employment Status	Student	15	37.5
	Worker/employee	17	42.5
	Elderly/retiree	8	20

Respondents were selected using purposive sampling to capture diverse backgrounds and visitation experiences. The semi-structured interview guide was developed based on universal design indicators (Story, 1998) and technical requirements outlined in the Ministry of Public Works Regulation (Permen PUPR No.14, 2017) concerning accessibility in public buildings. The guide was reviewed by experts for content validity and piloted with three visitors before data collection. All invited participants (n=40) agreed to take part, resulting in a 100% response rate.

Field data collection carried out in mid-2024, including direct observation of the mosque's physical condition, in-depth interviews using 11 semi-structured questions, and photo and field note documentation. The interview questions addressed various aspects: comfort and accessibility of the underground corridor (rubanah), stairs and ramps, availability and functionality of escalators, distance from parking areas to ablution spaces, signage and guiding blocks, comfort of the plaza area under heat or rain, and overall perceptions of spatial layout effectiveness.

Interview results were analyzed narratively and compared with universal design theory and national regulations to evaluate how closely the mosque's design aligns with inclusivity and accessibility standards. Data were processed using frequency tabulation and descriptive analysis, then interpreted in the context of relevant previous studies. The validity of findings was further enhanced through data triangulation involving survey data, field observations, and regulatory benchmarks.

Result

Identification of comfort factors related to the design of circulation elements at Masjid Raya Baiturrahman Banda Aceh

Based on the layout of Masjid Raya Baiturrahman, functional spaces such as four-wheeled vehicle parking areas, two-wheeled vehicle parking areas, and ablution facilities are located at the rubanah (basement/underground) level and are arranged in parallel. These areas are sequentially connected by the rubanah corridor, a series of repetitive transitional spaces that guide visitors upward toward the prayer hall as the central destination (see Figure 3).

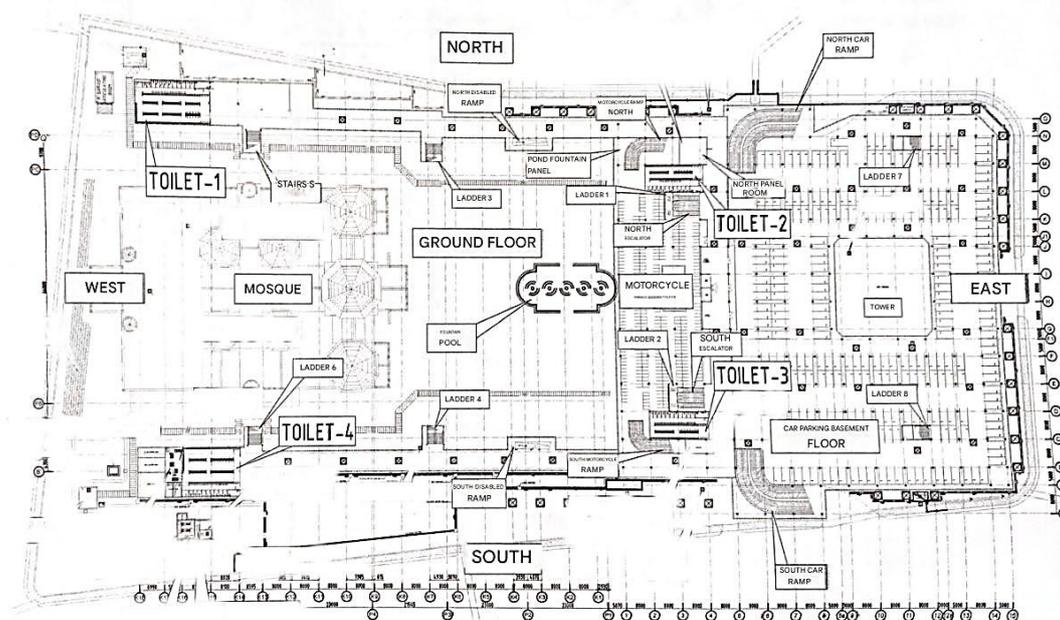


Figure 3. The layout plan of the Masjid Raya Baiturrahman

Source: Processed from the Aceh Public Works and Housing Agency's archive image documents

Table 3. Visitor comfort and circulation effectiveness at Masjid Raya Baiturrahman

Aspect	Very Comfortable	Comfortable	Less Comfortable	Never Used
Rubanah Corridor	45%	50%	5%	–
Stairs	23%	52%	25%	–
Ramp	30%	40%	10%	20%
Escalator	45%	35%	20%	–
Parking Area	3%	60%	20%	17%
Distance to Ablution Area	–	28% (not far)	47% (quite far)	–
Signage	60%	22%	18%	–
Guiding Blocks	63%	37%	–	–
Plaza (hot weather)	–	10%	90%	–
Plaza (rain)	–	70%	30%	–
Overall Circulation Effectiveness	–	74%	26%	–

Key findings from the assessment:

Rubanah Corridor: Highly comfortable (95% rated comfortable/very comfortable). Positive aspects included cool marble flooring, aesthetic value, and smooth circulation flow. Occasional crowding and resting visitors caused minor obstructions. These findings are consistent with previous studies (Tam et al., 2018; Lababede et al., 2020; Ahmed, 2022; Tatano & Revellini, 2023) which emphasize that circulation comfort is strongly influenced by material selection and clear routing.

Stairs: Majority found comfortable (75%), though slippery marble surfaces and missing center handrails were noted which are required by national standards (Permen PUPR No.14, 2017), for stairs wider than 220 cm. Positive notes included proportional riser height and width.

Ramp: Comfortable for most users (70%), but narrow width, limited visibility, and lack of disability-friendly features were concerns. This aligns with findings from research in Jeddah and Jakarta recommending wider ramps with non-slip surfaces and clear handrails (Sarsak, 2021; Aji et al., 2022).

Escalator: Mixed perception; 45% very comfortable, but frequent non-operation reduced reliability.

Parking Area: Generally comfortable, though some visitors noted steep/slippery access and irregular parking.

Distance to Ablution Area: Nearly half of respondents found it very far, especially challenging for elderly visitors.

Signage and Guiding Blocks: Most visitors found signage clear and guiding blocks necessary, supporting universal design principles.

Plaza Comfort: During hot weather, only 10% felt comfortable; during rain, 70% felt comfortable due to hydraulic umbrellas.

Overall Circulation Effectiveness: 74% rated the spatial arrangement effective; remaining 26% highlighted issues such as long distances and limited disability-friendly facilities.

Spatial analysis of Masjid Raya Baiturrahman, supported by circulation theory (Ching, 2007), shows that the mosque adopts a predominantly linear circulation pattern, directing visitors from the parking areas through the rubanah corridor to the ablution spaces and the prayer hall (Figure 4). This simple layout facilitates wayfinding but also poses challenges for elderly visitors and persons with disabilities, as the rubanah corridor extends approximately 205 meters and can be physically demanding to traverse.

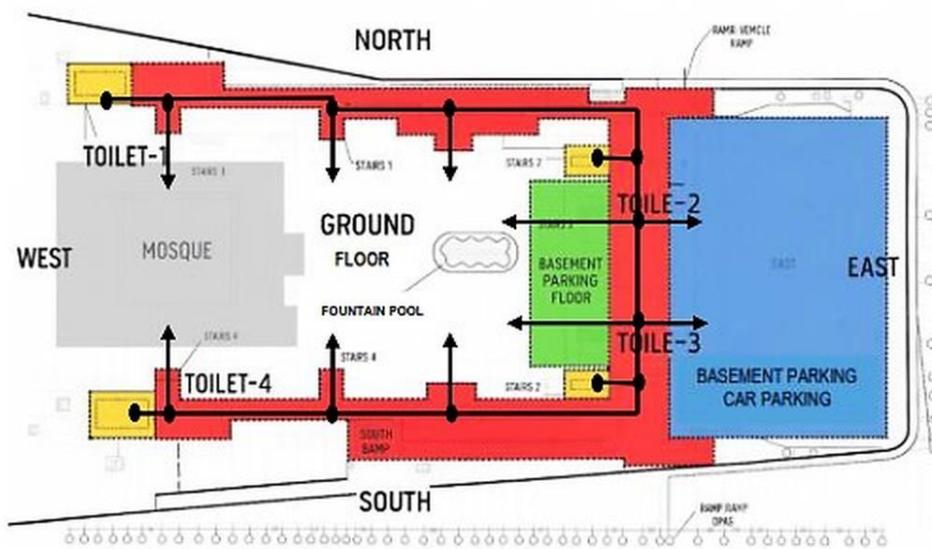


Figure 4. Circulation analysis of the mosque layout

Discussion

Figure 5 illustrates a summary of visitors' perceptions regarding circulation comfort within the study area. The findings of this study indicate that the implementation of universal design principles at Masjid Raya Baiturrahman Banda Aceh has not yet reached an optimal level. While certain design elements, such as the rubanah corridor are perceived as comfortable due to cool marble flooring and smooth circulation flow, several key facilities that support vulnerable user groups have not been fully integrated as primary design features.

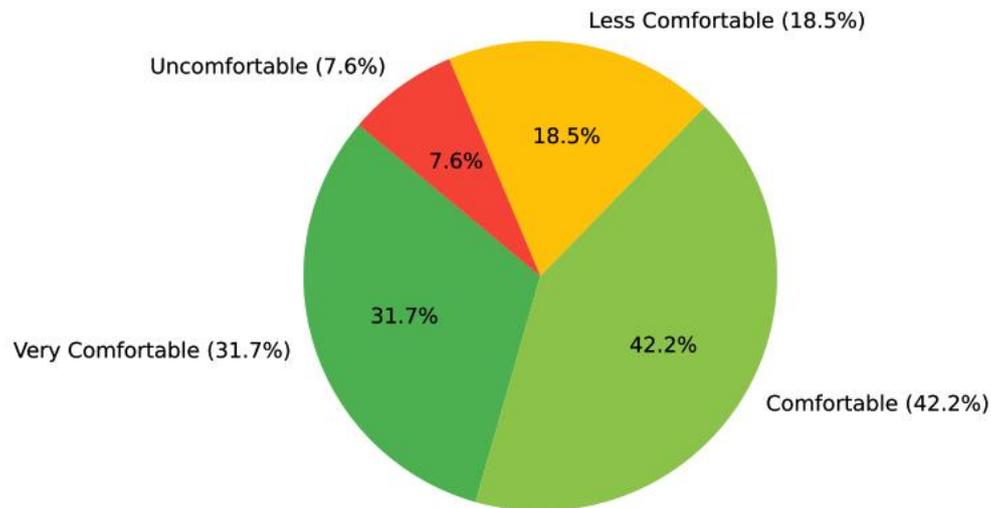


Figure 5. Visitors' perceptions on circulation comfort and accessibility at Masjid Raya Baiturrahman Banda Aceh

Ramp and escalator: Accessibility for people with disabilities not yet prioritized

The existing ramp, although having an ideal slope, is too narrow and located in less strategic areas, limiting its function as a primary access route. This contradicts the principle of equitable use, which emphasizes that facilities should be usable by all people without segregation or the need for "special" routes (Story, 1998). Likewise, the escalators are often inoperative, reducing their usefulness for elderly visitors and wheelchair users. According to Permen PUPR No.14 (2017), public buildings must ensure reliable and functional access for people with disabilities. Locating ramps and escalators away from the main circulation path (rather than parallel to stairs) supports findings by Suhardi et al. (2024), which highlight that ramps should be integral parts of the primary circulation network rather than merely add-on facilities.

Distance to women's ablution area: Gender-based accessibility concerns

The relatively long distance to the women's ablution area (reported as too far, particularly by elderly visitors) indicates insufficient attention to gender-based accessibility. Al-ajmi (2010) emphasized that modern worship spaces should ensure equal and convenient access for both male and female congregants.

Floor materials and safety risks

While marble flooring on staircases, ramps, and the plaza provides visual elegance and thermal comfort, it becomes slippery when wet and may overheat under intense sunlight, posing safety hazards. Budaiwi (2011) and Permen PUPR No.14, 2017 both stress the importance of using non-slip materials in public spaces to reduce the risk of accidents.

Guiding blocks and navigation for visually impaired users

The absence of guiding blocks indicates that the design has not fully aligned with the principles of perceptible information and size and space for approach (Story, 1998). Guiding blocks are essential navigation aids for blind and visually impaired visitors (Aji et al., 2022). Without them, the mosque environment becomes less inclusive.

Signage and language inclusivity

Some visitors noted that existing signage was unclear due to small font size and the exclusive use of the national language. According to the perceptible information principle (Story, 1998), essential information should be accessible to all users, including elderly visitors and those with visual impairments. Recommended improvements include larger fonts, high-contrast colors, the addition of Acehnese language, and the use of LED boards.

Climate context and plaza design

The large open plaza facilitates communal activities, yet limited shading and insufficient drainage reduce visitor comfort. Visitors experience excessive heat during the day, exacerbating the urban heat island effect (Asfour, 2009) encounter puddles and slippery surfaces during rain (Atmaca et al., 2021; Ghaleb Noman et al., 2016). This highlights the need for climate-adaptive design strategies. Although hydraulic umbrellas are already installed, they are not consistently operational or sufficient to provide adequate shading. Therefore, improvements such as permanent canopies, reliably functional hydraulic umbrellas, and better drainage systems are recommended.

Overall: Number of facilities versus design effectiveness

The core issue is not the mere presence or number of facilities, but whether their placement and design align with the seven principles of universal design (Story, 1998): equitable use, flexibility in use, simple and intuitive use, perceptible information, tolerance for error, low physical effort, and size and space for approach. Facilities like ramps, escalators, guiding blocks, signage, and ablution areas should form an integral part of the main circulation and spatial layout rather than being treated as optional additions. By adopting this approach, the mosque can evolve from being solely a visually impressive landmark to becoming a space that is truly functional, inclusive, and welcoming for everyone.

Practical Recommendations

To enhance inclusivity and comfort at Masjid Raya Baiturrahman, several practical measures are recommended:

Widening the ramps located at the rubanah (basement/underground) level that connect the parking areas to the plaza, and aligning them with the mosque's primary circulation routes so they serve as equitable access rather than secondary alternatives.

Ensuring escalators remain operational, especially during peak visiting hours, to assist elderly and disabled users.

Installing guiding blocks along key pathways to aid visually impaired visitors.

Applying anti-slip coatings on marble floors to improve safety under wet conditions.

Reducing the distance to the women's ablution area by constructing closer facilities or providing covered connections.

Enhancing signage through larger fonts, high-contrast colors, inclusion of the Acehnese language, and LED boards for better visibility.

Increasing shaded areas and upgrading drainage systems to address weather-related comfort.

To consolidate the findings and proposed improvements, the main accessibility and comfort issues identified at Masjid Raya Baiturrahman are summarized in Table 4. The table highlights key problems related to circulation, safety, and inclusivity, along with practical solutions that align with universal design principles, national standards, and Islamic values of accessibility and hospitality.

Table 4. Key issues identified and proposed solutions

Issue	Key Problem	Proposed Solution
Ramp and escalator	Ramp too narrow and not on main route; escalators often inoperative	Widen ramps and align with primary circulation; ensure escalators remain functional
Distance to women's ablution area	Too far, especially for elderly and female visitors	Provide closer facilities or covered connections
Floor materials (safety)	Marble becomes slippery when wet and overheats under sunlight	Apply anti-slip coatings and use alternative finishing materials
Guiding blocks	Absent, limiting navigation for visually impaired users	Install guiding blocks along main circulation paths
Signage and language inclusivity	Fonts too small, unclear, only in Indonesian	Use larger fonts, high-contrast colors, add Acehnese language and LED boards
Plaza and climate adaptation	Excessive heat, limited shading, puddles during rain	Add permanent shading, ensure umbrellas function properly, improve drainage systems
Overall design integration	Facilities exist but not aligned with universal design principles	Integrate ramps, escalators, guiding blocks, signage, and ablution areas into primary circulation flow

From an Islamic perspective, accessibility and inclusivity are integral to the values of justice (*adl*) and mercy (*rahmah*), which emphasize equal opportunity for all believers to perform worship without barriers. Designing mosques that accommodate the elderly, women, and people with disabilities is thus not only a technical obligation but also a moral and spiritual duty. The implications of this study extend to mosque authorities, architects, and policymakers, encouraging them to incorporate universal design principles as part of both regulatory compliance and religious responsibility.

However, this study has several limitations. First, the data were collected only at one mosque, which may limit generalizability to other contexts. Second, the sample size, although diverse, remains relatively small. Third, the qualitative descriptive approach relies heavily on respondents' perceptions, which may be influenced by subjective experiences. Future research could adopt a comparative or mixed-methods approach across different mosques to enrich understanding of accessibility in Islamic worship spaces.

Conclusion

Most visitors perceive the circulation and spatial design of Masjid Raya Baiturrahman as generally comfortable and effective, particularly appreciating the spacious rubanah corridors and well-organized parking areas. Quantitative analysis shows that 31.7% rated the facilities as very comfortable, 42.2% as comfortable, 18.5% as less comfortable, and 7.6% as uncomfortable. These results indicate that while 74% of visitors experience adequate comfort, notable shortcomings remain. Discomfort was most often reported by elderly visitors, people with disabilities, and women accessing distant facilities. The main issues include narrow ramps located away from primary circulation, long walking distances to the women's ablution area, frequently inactive escalators, slippery marble flooring, and the absence of guiding blocks for visually impaired users. Overall, these findings demonstrate that the implementation of universal design principles has not yet reached an optimal level.

For mosque administrators, designers, and policymakers, improvements should be undertaken in a phased but targeted manner:

High priority: Reposition and widen ramps to integrate with main circulation routes; Ensure escalators remain consistently operational, especially during peak hours; Install guiding blocks along major pedestrian pathways to support visually impaired visitors.

Medium priority: Apply anti-slip coatings to high-traffic marble floors to reduce accident risks; Provide closer or covered access routes to the women's ablution facilities to reduce travel distance.

Low priority: Upgrade signage with larger fonts, high-contrast colors, bilingual formats (Indonesian and Acehnese), and LED boards to improve clarity and inclusivity; Enhance shading and drainage in the plaza to address thermal comfort and safety during rain.

This study is limited by its single-case focus on one mosque and a relatively small sample size of 40 respondents, which may not fully represent diverse user experiences. Observations were also conducted during a specific period, potentially overlooking seasonal variations and peak-time visitor dynamics. Future research should: Conduct comparative analyses across multiple mosques in different regions; Include larger and more diverse respondent groups (e.g., women, elderly, and people with disabilities); Integrate quantitative

performance measurements such as walking speed analysis, slip-resistance testing of flooring, and thermal comfort evaluations.

By adopting these prioritized recommendations, mosque administrators can immediately improve visitor accessibility and comfort, while policymakers and designers can use the findings as a framework for national guidelines on mosque design. Beyond technical compliance, ensuring accessibility resonates with Islamic values of inclusivity (*shumuliyyah*) and justice (*'adl*), reinforcing the mosque's role as a spiritual, cultural, and social hub for all community members.

Conflict of interest

The authors declare no conflict of interest. Details of the contribution of each author are, Safriza Putra: Data collection, data curation, writing (original draft preparation), and final manuscript revision; Safwan Safwan: Project administration, formal analysis, and validation of results; Cut Nursaniah: Conceptualization, methodology design, and validation of results.

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